STUDENT ID NO

MULTIMEDIA UNIVERSITY

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

TES3141 – EXPERT SYSTEMS

(All Sections / Groups)

18 OCTOBER 2016
2.30p.m. – 4.30p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 5 pages with 5 questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

QUESTION 1

(a) An Expert System (ES) is very successful computer system that emulates, or acts in all respects, with the decision-making capability of a human expert. It has been deployed in various industries such as medicine, finance, science, and engineering. Describe THREE advantages of deploying an ES in an organization. [6 marks]

(b) Knowledge can be classified into procedural knowledge, declarative knowledge, and tacit knowledge. How do you distinguish procedural knowledge and declarative knowledge? [4 marks]

QUESTION 2

(a) Use the following to write quantified first-order predicate logic formulas:

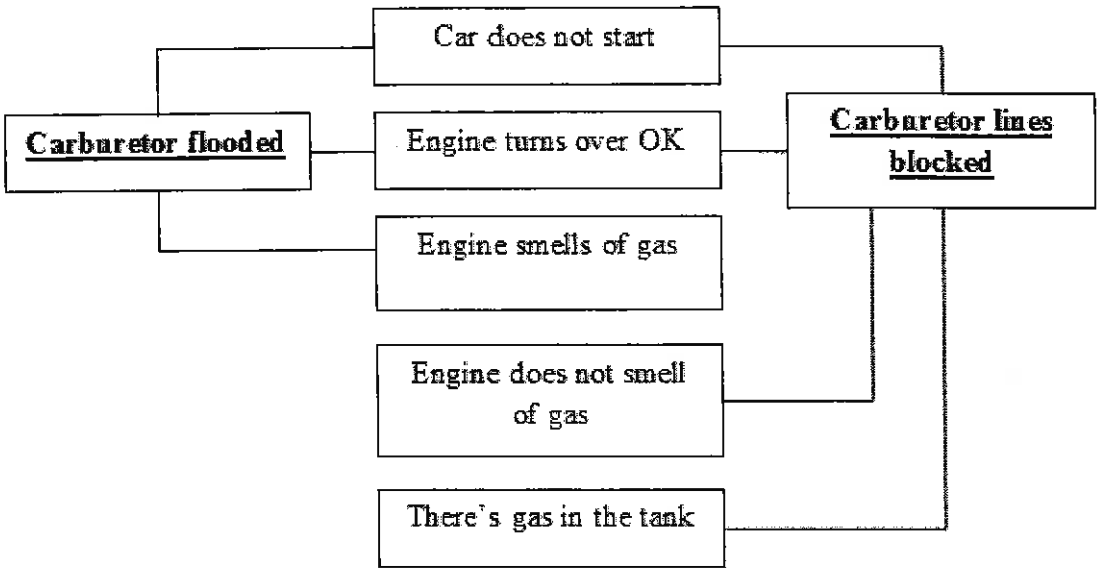
P(x) = x is a programmer
S(x) = x is smart

i. Everyone is not a programmer.
ii. Everyone is a programmer.
iii. Some programmers are not smart.
iv. There are programmers.
v. All programmers are not smart.
vi. Not all programmers are smart.

[6 marks]

Continued...

(b) Write IF-THEN rules to identify the problems based on the symptoms shown in the figure below. [Note: *problems are bold and underlined, the rest are symptoms*].


Car does not start
Carburetor flooded
Engine turns over OK
Carburetor lines blocked
Engine smells of gas
Engine does not smell of gas
There's gas in the tank

[4 marks]

QUESTION 3

(a) Draw a frame system for tablets. Consider their characteristics like name, manufacturer, operating systems, specialization (a-kind-of / is-a), and owner. Include one instance with filled slots.

[5 marks]

(b) Given the two sentences below:

> If I pass this subject then I get an A
> and
> I pass this subject and I do not get an A.

i. Write the sentences using logical symbols. [2 marks]

ii. Write the truth table of the sentences. [2 marks]

iii. Determine whether they are tautology, contradiction, or contingent statements. [1 mark]

Continued...

QUESTION 4

(a)

(i) Study the following information carefully.

```
IF        you have good working attitude
AND       you are lucky
THEN      you will be promoted soon      CF = 0.7


Assuming that

CF (you have good working attitude) = 0.8
CF (you are lucky)                  = 0.6
```

Calculate CF(you will be promoted soon).

[2 marks]

(ii) Study the following information carefully.

```
IF        you have good results
OR        you have good communication skills
THEN      you will get a good job       CF = 0.8

Assuming that

CF (you have good results)               = 0.7
CF (you have good communication skills) = 0.6
```

Calculate CF(you will get a good job). [2 marks]

Continued...

(b) Given the following information:

```
IF    Microsoft says Windows Phone will be popular
THEN  you can buy Windows Phone
CF_rule1=0.7

IF    Nokia says Windows Phone will be popular
THEN  you can buy Windows Phone
CF_rule2=0.6

Assuming that

CF (Microsoft says Windows Phone will be popular) = 0.8
CF (Nokia says Windows Phone will be popular)     = 0.7
```

Calculate $CF_{combined}(CF_{rule1}, CF_{rule2})$. Justify your answer based on the certainty factors. [6 marks]

QUESTION 5

Given the rules:

Rule 1: IF *study smart* THEN *pass subject*.
Rule 2: IF *study smart* THEN *fail subject*.

and assuming that:

p = pass subject
f = fail subject

Θ = {p, f}

$m_1(p) = 0.7$ $m_1(\Theta) = 0.3$ for Rule 1

$m_2(f) = 0.4$ $m_2(\Theta) = 0.6$ for Rule 2

i) Produce the Dempster-Shafer table showing the combination of evidence. [2 marks]

ii) Calculate the combined mass (before normalization). [1.5 marks]

iii) Calculate κ. [2 marks]

iv) Calculate the combined mass (after normalization). [1.5 marks]

v) Calculate the combined belief function. [1 mark]

vi) Calculate the plausibilities. [1 mark]

vii) Calculate the evidential intervals. [1 mark]

End of Paper